U.S. Department
of Transportation

**Federal Aviation Administration**

# Memorandum

Subject: **INFORMATION:** Review and Concurrence, Equivalent Level of Safety Finding for Cessna New Model 680; Doors separating the cabin. FAA Project #TC2548WI-T

Date: April 9, 2004

Reg Ref: § 25.807(i)

From: Manager, Airframe & Cabin Safety Branch, ANM-115

Reply to Attn. of: T.N. Baktha, ACE-118W

To: Manager, Wichita Aircraft Certification Office, ACE-115W

ELOS Memo #: TC2548WI-T-AG-2

**Background**

The Citation Model 680 is a 13 passenger + 2 crew, pressurized, low-wing monoplane powered with two pylon mounted Pratt & Whitney PW306C engines. The Cessna Model 680 has an aft lavatory/vanity area in the passenger cabin. This area is separated from the main section of the passenger cabin by pocket doors, which slide out of the privacy partitions and are held together in the middle by a magnetic strip. The seating configuration requested by Cessna includes placing a belted passenger side-facing seat in the lavatory/vanity area during taxi, takeoff and landing. This design creates two passenger compartments separated by a door within the passenger cabin. This is in conflict with § 25.813(e), which states: "No door may be installed in any partition between passenger compartments."

**Applicable Related Regulation(s)**

Sections 25.365(g), 25.783(j), 25.813(e), (f), 25.843(b)(4), and 25.1557(d)

Sections 25.365(g): The lavatory door (door closed) and the partition (door open) have been shown to comply with the pressurized compartment load requirements of § 25.365(g).

Section 25.783(j): To comply with § 25.783(j), the lavatory doors has been designed to preclude anyone from being trapped inside and is capable of being unlocked without the aid of special tools.

Section 25.813(f): The doors are designed to be latched in the open position during taxi, takeoff and landing to comply with the requirements of § 25.813(f), which allows for doors to be installed between a passenger compartment and an exit.

Section 25.843(b)(4): The doors have been demonstrated to function properly as specified by § 25.843(b)(4) after being subjected to flight tests prescribed in paragraph (b)(3).

Section 25.365(g): Per § 25.365(g) the doors have been shown comply with the sudden release of pressure specified § 25.365(e)

Section 25.1557(d): The doors are placarded per § 25.1557(d) to state the doors are to be latched in the open position during takeoff and landing.

**Regulation requiring an ELOS**

Section 25.813(e): The presence of the door precludes literal compliance with § 25.813(e).

**Description of compensating design features or alternative standards, which allow the granting of the ELOS (including design changes, limitations or equipment needed for equivalency)**

The airworthiness provision not complied with, in this case § 25.813(e), is compensated for by the following factors that provide an equivalent level of safety [ref. § 21.21(b)(1)]:

1. The lavatory doors have provisions to be secured open for taxi, takeoff and landing, and;

2. Limitations are established to require the lavatory doors to be secured open for taxi, takeoff and landing, and;

3. The lavatory door is designed to be a split sliding pocket door. The means of holding the doors in the closed position is a magnetic strip, and;

4. The lavatory is limited to one occupant, and;

5. The Airplane Flight Manuals (AFM) Normal Procedures Section discusses the latched open lavatory door as an item to check on the checklist of items to complete during the Before Takeoff and Before Landing sections, and;

6. The sliding pocket doors and the corresponding installation (in the open position) is substantiated for emergency landing (ultimate inertia) loads as applied per § 25.561(b). When the doors are latched open, they will remain open even if the aircraft is subjected to an emergency landing condition.

7. An amber annunciation in the cockpit is connected such that it is displayed if either of the two pocket doors is not latched open, when the aircraft is in a take-off or landing configuration. The annunciation should identify to the crew that the lavatory doors require attention. When both of the two pocket doors are latched in the open position, switches will be activated which open an electrical circuit, thus preventing the annunciation from activating. Redundancy is built into the system by providing dual switches, on independent circuits, at each latch mechanism. This annunciator system is integrated with the flap system, such that when the flaps are fully retracted or the doors are properly latched, the light will be off. In addition, the AFM defines instructions to address Abnormal Procedures in the event that the normal take-off and landing configuration is inoperative.

**Explanation of how design features or alternative standards provide an equivalent level of safety intended by the regulation:**

Section 25.813(e) exists to ensure that passengers do not become isolated in a passenger compartment during an emergency. The intended means of ensuring this is the prohibition of doors between passenger compartments. However, as is stated in Advisory Circular 25-17, under certain conditions, equivalent levels of safety have been granted to this rule if sufficient compensation is provided to achieve the level of safety intended by the regulation for one occupant.

Cessna's approach is to show that the doors will be open during an emergency. Cessna has accomplished this by the use of flight manual instructions, flight manual limitations, placards, procedures, and design features including an unlatched door warning system. They also show that compliance with related regulations support the equivalent level of safety finding. The compensating factors ensure the doors are open and a passageway is clear for emergency egress of the occupant(s), which is the intent of § 25.813(e).

A key feature is that the doors are sliding pocket doors with each door held in the open position by separate positive action latches. With both doors in the open position, any load that is applied to one of the doors to move it to the closed position would have the opposite effect on the other door. If there was a condition that resulted in one of the pocket doors becoming unlatched, closing and then becoming jammed in that fully closed position, that same condition is highly likely to cause the other door to remain in the open position. This would result in a 10-inch wide opening still being available for the occupant to pass through for evacuation.

Another key feature is the doors have an unlatched door warning system to ensure the doors are latched opon for taxi, takeoff and landing. An amber light in the annunciator panel, reading "LAV DOOR" is connected such that it illuminated if either of the two pocket doors is not latched open, when the aircraft flaps are extended. The Airplane Flight Manual defines the instructions to address Abnormal Procedures - Flaps Inoperative Landing, in the event that the flaps are unable to be extended for landing.

Aside from the compensating factors, the operator of the door has an additional means of identifying the doors' position. Tactile feedback is relayed to the operator by means of a clicking sound when the door is fully retracted and latched. The operator also feels the retract mechanisms of the latch as the door is latched open. This provides the operator with redundant means of identifying the doors position.

Although the door doesn't have an emergency egress panel as noted in AC 25-17 or an equivalent frangible door, Cessna has taken several steps to ensure the doors are open as mentioned above or can be opened. The sliding doors are held closed by a magnetic strip, which minimal force is required to open the door as to allow a 2 percentile size female occupant to open and latch the door in the open position for taxi, takeoff and landing. These doors are shown to function properly both before and after the pressurized compartment loads of § 25.365(g). Similar doors were specified in the Models 560XL, 650, and 750.

The Airplane Flight Manuals (AFM) Normal Procedures Section discusses the latched open lavatory door as an item to check on the checklist of items to complete during the Before Takeoff and Before Landing sections. The AFM has a limitation that the doors be latched open for taxi, takeoff and landing. In addition, the crew will notify the passengers of each exit

location during the passenger briefing. This information is also included on the passenger briefing cards, which are provided for each occupant seat.

As an additional measure, an Exit Locator sign is installed on the forward side of the open partition. This exit locator sign is visible when the lavatory door is closed and when the lavatory door is open, eliminating any confusion as to where the emergency exit is located. The exit locator sign will display the word EXIT with an indicating arrow pointing to the exit location.

**FAA approval and documentation of the ELOS**

The FAA has approved the aforementioned Equivalent Level of Safety Finding in Issue Paper AG-2. This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The Transport Directorate has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum Number should be listed in the Type Certificate Data Sheet under the Certification Basis section. [e.g. Equivalent Safety Findings have been made for the following regulation: § 25. 813(e) Door Between Passenger Compartments (documented in TAD ELOS Memo TC2548WI-T-AG-2)]

/s/

Signature: Alan Sinclair
Manager, Airframe & Cabin Safety Branch, ANM-115

Date: April 9, 2004

| | | |
|---|---|---|
| ELOS Originated by<br>Wichita ACO | Program Manager,<br>Tina Miller | Routing Symbol<br>ACE-117W |

*K:\COMMON\CE680\IP\Airframe\AG-2\ELOS MEMO_AG2.doc*
*anm113/mq/Cessna/680/ELOS/ELOS Memo_AG2 F.doc*